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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Yuji ISODA

Serial No.: 10/761,238 Group Art Unit: 2878

5 Filed: January 22, 2004 Examiner: GABOR, OTILIA

For: PREPARATION OF STIMULABLE PHOSPHOR SHEET

The Honorable Commissioner of Patents  
and Trademarks, Washington, D.C. 20231

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DECLARATION PURSUANT TO RULE 132

I, Yuji ISODA, am the inventor/applicant of the sub-  
ject patent application.

15

I hereby solemnly and sincerely declare that:

1. I am familiar with the prosecution history of  
the above-identified patent application.

20

2. I now submit comparative experimental data  
which are described in Japanese Patent Application No.  
2000-299003 for which the convention priority is claimed  
in the patent application.

25

[Example I]

(1) Preparation of phosphor material for deposition  
Cesium bromide (CsBr, 100 g, 0.47 mol.) and europium  
bromide (EuBr<sub>3</sub>, 1.8404 g, 4.7x10<sup>-3</sup> mol.) were mixed and  
30 pulverized in a mortar, and then processed in a stirring  
vibrator for 15 min. The resulting mixture was placed in  
a heating furnace. The gas contained in the furnace was  
evacuated for 3 minutes, and a nitrogen gas was intro-  
duced into the furnace. The mixture was fired in the  
35 furnace at 525°C for 2 hours. The furnace was then evacu-  
ated for 15 minutes, after the firing was complete.

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The resulting stimulable europium activated cesium bromide (CsBr:0.01Eu) phosphor was pulverized in a mortar, and the pulverized phosphor was compressed at 800 kg/cm<sup>2</sup>, to produce a pellet for deposition. The pellet  
5 was then placed in an evacuating vessel at 150°C for 2 hours, for degassing.

(2) Deposition of phosphor material on support

A support comprising a quartz frame united to a quartz sheet (numeral 1 of Figures 1A, 1B, and 1C.  
10 a=c=d=f=20 mm, g= 500 μm, b x e=40 cm x 40 cm, h=10 mm) was prepared.

In a depositing apparatus, the support and the phosphor pellet produced above were placed in the predetermined positions. The apparatus was evacuated to reach a  
15 pressure of  $3.0 \times 10^{-6}$  Pa.

To the phosphor pellet was applied an electron beam from an electron gun at 60 W and at an accelerating voltage of 4.0 kV for 20 minutes, whereby depositing a  
20 stimulative phosphor on the support in the area enclosed with the frame at a deposition rate of 25 μm/min.

After the deposition was complete, the application of electron beam was ceased, air was introduced into the apparatus, and the support was taken out of the apparatus.

25 It was observed that columnar phosphor crystals vertically were deposited on the support to form a stimulative phosphor layer (numeral 2 of Fig. 1A) of approx. 480 μm thick. The length and width of the columnar crystal is approx. 480 μm and approx. 10 μm, respectively.

30 Thus, a stimulative phosphor sheet composed of a support and a deposited stimulative phosphor layer was prepared.

(3) Preparation of protective layer

Silicon dioxide (SiO<sub>2</sub>) was deposited on the stimulative phosphor layer and the top of the frame in the same  
35 manner to form a protective SiO<sub>2</sub> glass layer (numeral 3 of

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Fig. 1A).

Thus, an air-tightly sealed stimuable phosphor sheet (Figures 1A, 1B, 1C) of the invention was manufactured.

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[Comparison Example 1]

The procedures of Example 1 were repeated except for replacing the support having the frame (Fig. 1A) with a simple quartz sheet (thickness: 10 mm) and depositing SiO<sub>2</sub> on the stimuable phosphor layer and the periphery of the quartz sheet, to manufacture a sealed stimuable phosphor sheet (Fig. 2A) having a quartz sheet (51), a stimuable phosphor layer (52) and a protective glass layer (53).

15 [Comparison Example 2]

The procedures of Example 1 were repeated except for replacing the support having the frame (Fig. 1A) with a simple quartz sheet (thickness: 10 mm). Subsequently, a separately prepared spacer (width: 20 mm, height: same as the height of the phosphor layer) was fixed to the periphery of the quartz sheet, and then a polyethyleneterephthalate sheet (thickness: 50  $\mu$ m) was fixed to the upper surface of the stimuable phosphor layer and the top of the spacer via adhesive, to manufacture a sealed stimuable phosphor sheet (Fig. 3A) having a quartz sheet (61), a stimuable phosphor layer (62) and a protective layer (63).

[Comparison Example 3]

30 The procedures of Comparison Example 2 were repeated except for depositing SiO<sub>2</sub> glass layer on the stimuable phosphor layer and the spacer in place of fixing the polyethyleneterephthalate sheet to the stimuable phosphor layer and the spacer via adhesive, to manufacture a sealed stimuable phosphor sheet (Fig. 3A) having a quartz sheet (61), a stimuable phosphor layer (62) and a

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protective layer (63).

5



Fig. 1A

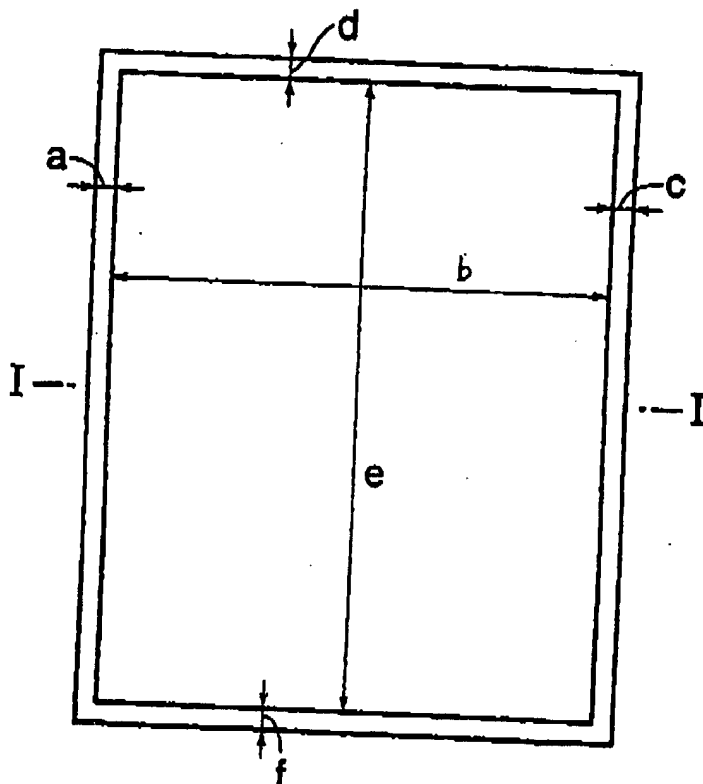


Fig. 1B

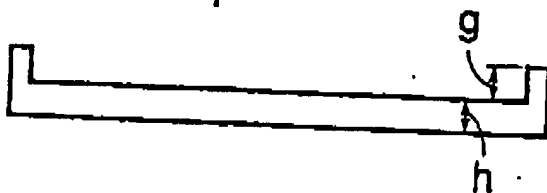


Fig. 1C



Fig. 2A

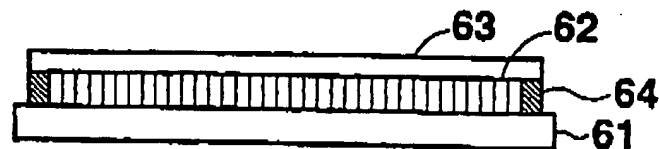


Fig. 3A



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## [Evaluation of Moisture Resistance]

Each of the sealed stimuable phosphor sheets manufactured in Example 1 and Comparison Examples 1 to 3 was  
5 evaluated in its moisture resistance by the following methods.

The sealed stimuable phosphor sheet was placed in a room kept at 40°C, 80%RH for one week. The amount of stimulated emission emitted from the stimuable phosphor  
10 sheet was measured according to the known radiation image recording and reproducing method just before and just after the sealed stimuable phosphor sheet was placed in the room, and the measured amounts were compared. The results of comparisons are marked according to the following criteria:  
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A: Stimulated emission decreases by less than 5% after the moisture resistance test

B: Stimulated emission decreases by 5 to 10% after the moisture resistance test

20 C: Stimulated emission decreases by more than 10% after the moisture resistance test

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Moisture Resistance

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Example 1

A

Comparison Example 1

B

Comparison Example 2

C

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Comparison Example 3

C

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## [Observation of Experimental Results]

In my understanding, the stimuable phosphor sheet  
35 of Comparison Example 1 embodying the stimuable phosphor sheet of Arakawa et al. (U.S. Patent 6031236) which is outlined by the Examiner in the Office Action at page 3. Apparently, the moisture resistance of the stimuable

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phosphor sheet of the invention is higher than the moisture resistance of the stimuable phosphor sheet of Arakawa et al.

5           3. I further declare that all statements made  
herein of my own knowledge are true and, that all state-  
ment made on information and belief to be true; and fur-  
ther that these statements were made with the knowledge  
that willful false statements and the like so made are  
10 punishable by fine or imprisonment, or both, under Sec-  
tion 1001 of Title 18 of the United States Code, and the  
such willful false statements may jeopardize the validity  
of the application or any patent resulting therefrom.

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Date: November , 2004 By: \_\_\_\_\_  
Yuji ISODA